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Forging New Frontiers

By Diana Granitto, Senior Editor, IEST

By 1958, the nascent environmental engineering profession had moved from wartime activities into the space age, and this journal began documenting the evolution of an industry. Over the past five decades and under as many titles, the *Journal* has witnessed advances into contamination control, ecological sciences, and nanotechnology, to name a few.

Keywords
Aerospace, reliability, contamination control, environmental engineering, *Journal of the IEST*

As the inaugural issue of *The Journal of Environmental Engineering* rolled off the press in October 1958, the National Aeronautics and Space Administration (NASA) was beginning operations and the race to explore the universe was heating up. "Since man is destined to venture into the space beyond the atmosphere he must learn to cope with a new atmosphereless environment," proclaimed an article titled "Space and High Vacuum"[1] in that pioneering issue of the *Journal*, predecessor of the current *Journal of the IEST*.

Readers of the new journal, which was issued by the Society of Environmental Engineers (SEE), also found advertisements promising to help them bring outer space into their laboratories. The following year, SEE merged into the Institute of Environmental Sciences (IES) and renamed the publication *The Journal of Environmental Sciences*.

It was World War II that had propelled the environmental engineering field into its own. War was waged in every environment—the Arctic, the tropics, at sea, in the mountains, in the air—and in every season and climate. These diverse conditions had to be simulated in the lab to allow a quick evaluation of new equipment.

Who Am I?

It is 1969. I am 41 years old and have a bachelor degree in mechanical engineering. After gaining about 10 years of experience in my field, I now hold a management position earning an annual salary of $16,000.

Answer: I am a professional environmental engineer and a reader of the *IES Journal*.

IES membership survey results reported in the August 1969 issue.[2]

This experience gave environmental engineers the "right stuff" to take the lead in reliability testing for the post-war space program. "The reliability of space vehicles and systems must far exceed the presently achieved levels of reliability before man can venture into outer space confident of his safe return to earth," cautioned an October 1960 article titled "Reliability Planning in Space Systems,"[3] which proposed a method using "design analysis techniques rather than mathematical models to establish design goals."

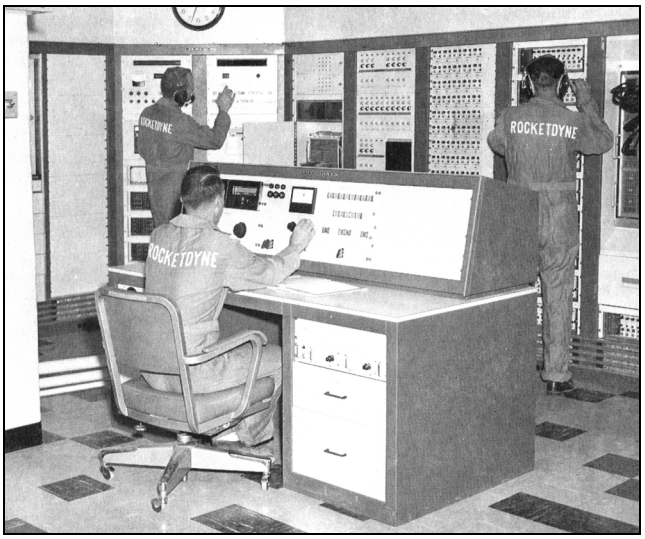
And so the industry was ready when President Kennedy declared in 1961: "I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to the Earth."[4]

Identity crisis

As is typical with any emerging field, environmental engineers struggled to comprehend and delineate their role. An article in the October 1962 *Journal*[5] opened with the question: "What has environmental engineering contributed to the technology of space research?" While other branches of engineering were well defined, environmental engineers were expected to blend into an "amorphous body of physicists, chemists, biologists, meteorologists, geographers, mechanical, chemical, and electrical engineers, and other environmentalists currently contributing to the effort." An analysis of the contemporary environmental literature led the author, R.S. Hooper, to propose the following definition:

"Environmental engineering is … concerned with the sources, the simulation and facilities, the instrumentation and measurement, the mitigation and protection, the methods and effects of any one or more of fifteen environments … radiation, vibration, high temperature, low pressure, low temperature, mechanical shock, acceleration, gaseous, humidity, static (or mtl properties), climatic, acoustic, biological, electrical, and high pressure."

A December 1963 article[6] elaborated on this characterization: "The old classical approach of developing and building a new product and then turning it over to the environmental engineer for testing has become a thing of the past. Today's ever changing technology demands that the environmental engineer play a simultaneous role in the development process and that he design and improvise techniques and equipment to simulate the end-use demands of our new products."



This 100-channel, high-speed digital data acquisition system, with a sampling rate of up to 15,000 samples per second, is cited in the December 1963 issue as an example of the important contributions of the environmental engineer.[6]

Going Green

After a decade of publication, the *Journal* celebrated the role of IES members in the Apollo Moon Landing and, with that success in hand, announced a new mandate. "[W]e must now set new goals for the decade ahead," wrote Harold C. Jones,[7] who had served as the first IES president. "In doing so it is essential that our thrust again be closely aligned with our national goals. We should, I believe, broaden the Institute to encompass the entire spectrum of the Environment including water and air pollution, noise control and similar environments."

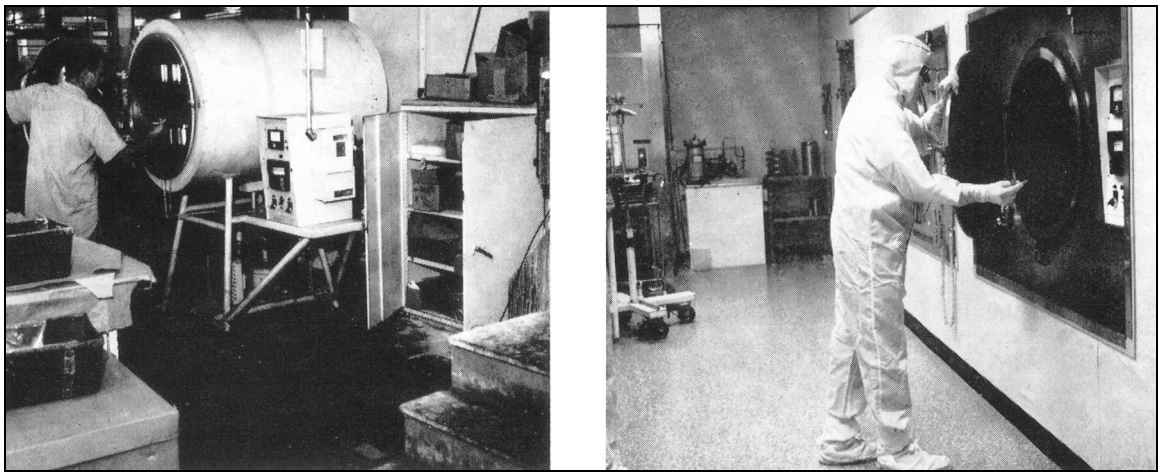
This proposed move was a subject of debate at the 1968 IES National Meeting and triggered lively discussion in the *Journal* pages for years to follow. Naysayers opposed the perceived attempt "to be all things to all people" and argued that other professional societies were better equipped to address issues such as pollution, energy sources, and ecological problems.

"It is now the age of Aquarius and *The Greening of America*," countered Maurice H. Simpson in a 1971 paper, "Environmentics."[8] Simpson undertook to place this new direction in the context of IES members' traditional role based on a system viewpoint, asserting that "the environment is not just the climate-terrain-shakes-and-shocks, but includes the sociological, political, economical, physiological, ecological [and other disciplines]."

IES was reorganized to add an Ecological Sciences Division and, through the 1970s, the *Journal* carried such titles as "The Effect of Air Pollution on the Burden of Illness in a New York Population," "Noise from Construction, Home Appliances and Building Equipment," "Fresh-Water Resources as a Limit of Man's Ecosystem," "The Nuclear Energy Debate: Economic Savior or Environmental Curse," "Problems and Practices of Solid Waste Management in Asia," and "Land Use as an Environmental Science."

Move into Contamination Control

While IES eventually withdrew from these ecological issues, the 1970s brought another new direction that quickly became a mainstay of the organization. As a result of a 1973 merger with the American Association for Contamination Control (A^2C^2), the Institute gained a new category of members involved in activities that "are at the forefront of contamination control," wrote Frank W. Hallstein in his President's Message in the January/February 1974 issue.[9] "Industrial contamination control and biosciences are the major areas of interest."



An early article on cleanrooms discussed the contrast between an uncontrolled environment (left) and one in which "the total population of airborne particles 20 millionths of an inch and larger are under control."[10]

Contamination control topics began to appear in the September/October 1973 issue with a paper discussing results of a study on the application of ultrasonic excitation to control contaminated surfaces in spacecraft.[11] A 1974 article, "Is a Clean Room the Answer?," proposed that for a cleanroom to succeed, four key elements had to receive the following priority: 1) cleanliness assurance system, 2) product cleanliness control, 3) worker-oriented contamination control, and 4) airborne dust control.[12] Coverage in subsequent issues quickly expanded beyond the aerospace industry to consider semiconductor and microbiology applications.

Setting Standards

The debut of contamination control in the *Journal* also featured the first of many articles on the industry's foremost cleanroom standard, Federal Standard 209 (FED-STD-209).[13] The *Journal* continued to document the progress of the standard for two decades until, in the 1990s, work began on an series of international standards that eventually would supercede FED-STD-209. The Institute of Environmental Sciences and Technology (IEST), successor to IES, was instrumental in the formation of a new technical committee of the International Organization for Standardization (ISO), ISO/TC 209 Cleanrooms and associated controlled environments. The January/February 1999 issue of the *Journal* carried a special section detailing the documents produced by the various TC 209 Working Groups and the market implications of these new international standards.[14]

Journal Milestones

1958 Society of Environmental Engineers (SEE) launches *The Journal of Environmental Engineering.*

1959 SEE merges with the Institute of Environmental Engineers (IEE) to become the Institute of Environmental Sciences (IES). The journal is renamed the *Journal of Environmental Sciences.*

1971 IES forms a new Ecological Sciences Division and the *Journal* begins covering ecological topics such as pollution control, ecosystem modeling, solid waste management, water quality, noise abatement, and energy sources.

1973 American Association for Contamination Control (A^2C^2) merges with IES. The *Journal* expands coverage to include contamination control topics.

1990 The *Journal* is renamed *Journal of the IES.*

1995 The *Journal* is renamed *Journal of the Institute of Environmental Sciences.*

1997 IES becomes the Institute of Environmental Sciences and Technology (IEST).

1998 The *Journal* is renamed *Journal of the IEST.*

2004 The *Journal* is published on CD-ROM in addition to the print version.

2005 The *Journal* begins publishing exclusively online.

The *Journal* already had a history of reporting on standards development. As early as 1963, an article on international environmental testing standards spelled out the role of IES as "the only national professional society whose mission embodies all aspects of environmental problems in science and engineering."[15] Ongoing coverage followed activities of the International Electrotechnical Commission (IEC) Technical Committee 50—Environmental Test Methods. The *Journal* also followed revisions of MIL-STD-810, *Test Method Standard for Environmental Engineering Considerations And Laboratory Tests*, heralding revision 810D with a 1983 headline, "Goodbye Charlie, Hello Dolly."

In addition to participating on the international front, the Institute began to produce its own Standards and Recommended Practices (RPs). In 1976, the *Journal* published "Specification for Garments Required in Clean Rooms and Controlled Environments: Tentative Standard #70-01-001,"[16] a predecessor of the current IEST-RP-CC003 on garment system considerations. Thirty years later, an article titled "IEST Focuses on Facilities in Nanotechnology Initiative"[17] reported on the efforts of a new Working Group, as the Institute and the *Journal* remain at the forefront of a changing industry.

Coming in October 2008: Journal *retrospective coverage continues as the industry evolves to meet the demands of a new millennium.*

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